LETTERS TO THE EDITOR.

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Synchronous Signalling.

THE following Board of Trade notice to mariners, recently issued, is one of exceptional interest and importance; for, thanks to American initiative, we find here for the first time a practical application of the principles of synchronous signalling.

"NEW YORK HARBOUR APPROACHES.—*Fire Island L/V.* Radio Dist. Determining Apparatus Installed.—The attention of all ships nav the approaches to New York Harb. is invited to the recent installation on Fire Island L/V. of a combined radio and submerged sound sig. transmitter which determines the receiving ship's distance from the L/V. (Call letters NLS.; station, 40° 28′ 40″ N., 73° 11′ 26″ W.)

"This apparatus will be in operation during fog, mist, rain, or falling snow. The range of this apparatus is limited to the receiving range of the submarine bell receiving equipment employed on shipboard, and in all practical cases this is within six or seven miles. The submarine bell strikes six strokes, pause, then eight strokes once every 38 sec. Beginning shortly after the first stroke of the '6' submarine character, about ½ sec., the ship emits a series of radio sigs. In order to determine the dist. of a ship from the L/V. it is necessary to count each of these radio dots until the *first stroke of the six submarine sigs. is received.* The number of dots thus determined gives the dist. in half sea miles from the L/V. Example:—(*a*) Eleven radio dots are received before the first stroke of the bell; the dist. is 11/2, or 5½ miles. (*b*) Four radio dots are received, the first submarine bell sig. appearing midway between the fourth and fifth radio sig.; the total number of radio sigs. received is 4½, and the dist. is 4½ divided by 2, or 2¼ miles. The most convenient method of receiving these sigs. is to have one receiver connected to radio and the other receiver connected to submarine bell detector, thereby connecting one ear to radio sigs. and the other to submarine sigs. These sigs. will also be furnished in clear weather when requested to do so by radio. It is requested that all passing vessels equipped with submarine sig. receiving apparatus familiarise themselves with this apparatus and report success obtained to the Hydrographic Office. Wave length used is 600 metres. Watches are stood as follows:—(1) Continuously during thick weather. (2) During clear weather, first 15 min. of every hour from 8 A.M. to 9.15 P.M. Although this station has proved accurate on test, the apparatus is in an exper. stage, and too much reliance should not be placed on it until its worth has been proved under service conditions."

It will be understood that the particular mode of applying synchronous signals herein described enables the mariner to dispense with the use of stop-watch or chronometer. The ordering of the faster-travelling signals is such as to supply the place of a timepiece. If a wireless and submarine signal be started together, the latter lags 1·2 sec. for each mile travelled, or for each half mile the lag is 0·6 sec. Hence if the instantaneous signal is repeated every 0·6 sec., the first of these being emitted 0·6 sec. after the first submarine signal, the mariner at half mile distance from the shore station gets both initial signals together. At one sea mile he gets the first submarine signal along with the second radio dot; at one and a half sea miles the third radio dot coincides with the first submarine bell stroke. Hence the rule: Divide by 2 to find the distance in sea miles. If the mariner is closer than half a mile the submarine signal comes in first. It is, perhaps, open to question if this is better than the arrangement of starting the signals at the same instant. In the latter case the mariner counts up the radio dots until the submarine signal is heard, subtracts 1, and divides by 2. In this ordering he always hears the radio signal first.

It is to be hoped that this will be a successful inauguration of a reform in maritime signalling. Our signalling stations are not nearly so valuable as they would be if synchronous signalling was made more general. In many cases the more important apparatus required is already installed. It must be borne in mind that both light-flash and aerial sound signals of abrupt character may be used in synchronous signalling.

The application of synchronous signalling to avoiding collision at sea is perfectly simple, and the step now taken should lead to its careful consideration and trial. In this case a vessel, A, when overtaken by thick weather, emits synchronous signals, say, every two minutes. This would be automatically effected by a clock-work contact maker. (The radio signals might consist of eight or ten consecutive dots spaced 0·6 sec. apart.) Another ship, B, hearing these, not only learns of the presence of A, but also gets her distance at once. B is also signalling, so that like information reaches A. Each ship now signals her course and speed. This is a familiar operation between ship station and shore station or between one ship station and another, and takes only a few seconds. The navigating officers on A and B then read on an instrument of simple construction (1) the rate at which the ships will be nearing one another, and (2) the mutual bearings of the two ships—*if collision is threatened.* And now after two minutes each officer, on receiving the second synchronous signal of the other ship, is able to say whether danger threatens him or not. For if this second signal tells him that the ships have approached each other by a certain distance during the two minutes (a distance read directly on the "Collision Predictor") there is danger of collision. If the distance covered is less than this (it cannot be greater), there is safety. The third synchronous signal may be used to confirm the result.

By this method, if the danger of permitting ships to sail in open waters unprovided with the requisite equipment (both instrumental and personal) be avoided by proper and stringent regulations, high speeds in open ocean could with safety be maintained in any weather.

J. JOLY.

Trinity College, Dublin.

Calculating Machines.

MAY I make an appeal through your columns to any men of science who have calculating machines of any kind not in active use to communicate with me? My laboratory has at present very heavy computing work of an *urgent* character in hand for a Government department. This keeps nine machines running almost incessantly, and when any machine gets out of order it is, in existing circumstances, almost impossible to get it rapidly and effectively repaired. Quite fancy prices are now being asked often for completely worn-out machines. If any one of the readers of NATURE has a machine in reason-

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able condition, which is not in use, and is willing to part with it for work of national importance at a reasonable price, I should be glad to hear from him the particulars as to type, condition, and price desired. When the war is over machines will return to their normal price—indeed, will probably be at reduced prices, for the war has taught many persons their value, and the market will be wider than it has hitherto been, so that foreign monopolies are certain to be broken down. KARL PEARSON.

Department of Applied Statistics, University College, University of London, July 5.

The Hippocampus in Ancient Art.

REPRODUCTIONS of early figures of the common Mediterranean species of Hippocampus have been published by Prof. Raymond Osburn in the *Zoological Bulletin* for March, 1915, and also by the present writer in the annual report of the Smithsonian Institution for the same year.

It is remarked in the latter of these articles that no mention is found in Aristotle of this striking form of fish-life, and the term "Hippocampus" was used by the poets of classical antiquity as the name of a sea monster, half-horse and half-fish, on which sea divinities rode. Nevertheless, the design of the seahorse occurs not infrequently in the plastic arts of Hellenistic civilisation, both in Greece and in Italy. The seahorse is figured occasionally also among the island gems, as stated by Fürtwangler, who figures one of them (*Antike Gemmen,* vol. i., pl. v.).

Figures of animals, including fishes, represented in ancient Grecian vase paintings have been made the subject of special study by a young French artist, Morin-Jean,[1] and a compatriot of his, P. H. Boussac, has written interesting articles on fish designs inscribed in ancient Egyptian monuments.[2]

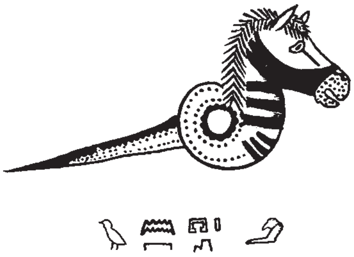

FIG. 1.—Hippocampus, from an Egyptian mummy-case, *c.* 500 B.C.

Only one instance is known where the Hippocampus is depicted in ancient works of art from the Nile valley. The design referred to forms part of a decorative painting in the interior of a mummy-case dating from the Twenty-sixth Dynasty (700–500 B.C.), now preserved in the City Museum of Gloucester. A brief description of it is given in vol. ii. of the "Historical Studies" published by the British School of Archæology in Egypt, and this is accompanied by a photograph of the original, which we have copied in the annexed figure.

Certain of the details are thus indicated in the description just referred to:—"The greater part of the Hippocampus is outlined in black on the white ground of the coffin; the ears, the eyes, the nostril, and the mane [*i.e.* conventionalised dorsal fin] are indicated in black; round the jaw is a wide black band edged with yellow; the muzzle is yellow with black dots; the wide horizontal stripes on the neck are alternately blue and red edged with black. . . . The date of the coffin accords well with the period of the archaic Athenian pediments." C. R. EASTMAN.

American Museum of Natural History,
New York.

THE HUNDRED-INCH REFLECTOR OF THE MOUNT WILSON OBSERVATORY.

BY the courtesy of Prof. Hale we are able to reproduce the accompanying interesting photographs relating to the giant reflector of the Mt. Wilson Observatory, which is now rapidly approaching completion.

The history of this great telescope dates from 1906, when Mr. John D. Hooker, of Los Angeles, presented the sum of 45,000 dollars to the Carnegie Institution for the purchase of a glass disc and to meet other expenses incident to the construction of a 100-in. mirror for a reflecting telescope of 50 ft. focal length. In making this gift, Mr. Hooker was well aware that the construction of such an instrument was to be regarded as an experiment, but in view of the great possibilities in astrophysical research which a large reflector seemed to offer, the experiment was considered to be well worth making. No insuperable difficulty was anticipated in the casting of a suitable disc by the French Plate Glass Company, of St. Gobain, and there was every reason for confidence in Mr. Ritchey's ability to grind and figure the mirror to the highest pitch of perfection. Experience already gained with the 60-in. telescope also gave confidence that the mounting of the larger instrument could be successfully accomplished.

Although no financial provision was made for the mounting and housing of the proposed telescope, Mr. Hooker's gift was accepted, in the confident belief that in due course a donor would be forthcoming.

An order for the disc was accordingly placed in the autumn of 1906, and the building in which the grinding, figuring, and testing of the mirror were to be carried on was erected during the following winter. In 1908 Prof. Hale reported that a disc had been successfully cast, but in the following year it was stated that on its arrival in California the disc exhibited many defects, and had been immediately rejected. The makers generously expressed their willingness to bear the loss and to make a further attempt. A large furnace and melting-pot capable of holding twenty tons of material were constructed, and improved methods of annealing were introduced. Early in 1910 another large disc was successfully cast, but owing to defects in the mould, strains were set up during annealing, and the disc was broken.

In view of this disappointment it was resolved to make a trial of the disc which had previously been laid aside, and grinding was commenced in the autumn of 1910. Meanwhile, further attempts to cast a disc free from flaws and bubbles were made, but again, owing to difficulties of annealing, a second disc was fractured in the oven. In the course of these trials, however, a flawless disc of the necessary diameter was produced, but its thickness was only 8 in., and this was not considered adequate to prevent deformation, unless a very perfect system of supports could be devised.

Mr. Hooker, unfortunately, did not live to witness any progress beyond this stage, having died on May 24, 1911.

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[1] "Le dessin des animaux en Grèce, d'après les vases peints." Pp. 262, illustrated. (Paris, 1911.)

[2] "Les poissons sur les monuments pharaoniques," *Le Naturaliste*, vols. xxxi. and xxxii. (1909–10).

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